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Impact of Educational Technology on Higher Education in Japan

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by

Lord Ronald Oxburgh of Liverpool, KBE, FRS

celebrating 650 years of education and learning
at Trinity Hall, Cambridge.

Science, Education and the dot.com Society

Quotation from Financial Times, 31 July/1 August 1999.

> "We are hurtling along, carried we know not where, by a troika. Capitalism, science and technology, the three super stallions of the new millennium, are careering out of control, dragging us into the unknown".

Whether we like it or not science is an integral part of everyday twenty-first century life. It will not go away. The genie is out of the box and we have to live with it. But how will we do better. By education? But by what education, and for whom.

We have to start by recognising that science is a pretty mixed bag. Some parts are well established and understood. Other parts are, more problematical. Commonly observations are reliable but the conclusion to be drawn from these observations are a matter of judgement and may be wrong. In some cases even the observations are controversial. This is hardly surprising given the complexity of the scientific problems to be tackled today. Much of the achievements of the nineteenth and twentieth centuries science was expressed in chemistry and engineering of construction. Great although these achievements were, they were relatively easy by comparison with the challenges of the twenty first century, where survival depends on understanding the phenomenal complexities of living things and how they interact with each other and their environment. This was a lower priority in earlier times when we were fewer and out impact on each other and on our surroundings was much less.

Part of the political difficulty is that public expectations of science are too high. Science teaching at school tends naturally to be based on those parts that are well understood and can be tested by experiment or observation. There tends to be little emphasis on the vast tracts of ignorance. It is in these areas where certainties, if there be any, emerge rather slowly that working scientists spend most of their time. As the practical content of school science teaching becomes smaller and smaller - whether for reason of cost or health & safety - the situation grows steadily worse as pupils lose the salutary experience of experiments that sometimes don't work. Ideas of uncertainty and doubt do not feature large, and the words 'scientific proof' in every day parlance carry the imprimatur of ultimate veracity.

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Executive Summary

This report summarises the opinions of 10 experts Higher Education in the field of educational technology. These experts were teachers, administrators, technologists and pedagogues. They included both junior and senior staff. A set of questions was prepared covering the following topics: -

1. University environment
2. Relationship between academic and technology Staff
3. e-Technology
4. Innovation in teaching and learning
5. Management of change due to the application of technology to teaching and learning
6. Strategy for quality control management
7. Staffing of support centres

Each interview, lasting approximately an hour, was recorded and each of the transcript was checked by the person interviewed. All the opinions expressed were the views of those interviewed. The summary (5 pages) condenses these views because the total transcripts amount to approximately 140 pages.

In Japan since the early 1990s there have been 3 major factors changing the shape of Higher Education. There are major demographic changes in the traditional student population in the age range 18-22.The number of new students is falling from 2 million per year to 1.2 million, resulting in competition to attract students between the universities. A major factor in this competition is the quality of teaching. It does not yet seem to have spurred the universities to look seriously for other kinds of student, e.g. from different age groups who might wish to study but because they are working cannot attend university as a full time student and might be attracted by distance learning methods.

The second factor is the introduction of Information and Communications Technology (ICT) which offers the opportunity to introduce new ways of teaching and learning. These opportunities will allow the universities to respond to new types of demand for education that would not have been possible in the traditional ways of teaching. Also this will permit the educational process to shift from a teaching led style to new styles where the emphasis changes to learning.

Another factor is the change in the organisation of the National Universities to agency status, where they will be responsible for their own finances and organisation - a change that has already taken place in North America and in parts of Europe. This change will give the universities much more autonomy and the freedom to experiment in new teaching and learning methods.

Compared to North America and UK there is very little distance education in Japan, because there is no demand. This may change with the reduction of high employment levels and the need for people to re-train in new areas, which will require universities to make new courses available. Until recently much of the training for industry has been handled in-house by the companies, but as job mobility increases and the pace of change in technology show no sign of slackening there is a need for re-training and re-educating people far beyond the 18-22 are range. This is giving rise to new collaborations between universities and industry, where the universities provide the teaching and industry becomes a partner in collaborative projects.

One of the major problems in Japanese universities is the small number of educational support departments that exist to help develop the new teaching and learning techniques. The effort to change is quite substantial and the results are not necessarily apparent in the short term. The established university teachers are reluctant to change primarily because of the effort involved and if they cannot call upon pedagogic and technological help they do not know how to make the required changes. The two technologies that are strongly involved in the changes stimulated by ICT are the development of web-based teaching and the use of networks, such as video networks and in the near future wireless networks. Technology assistance is imperative and the new teaching and learning situations demand carefully examination of the pedagogical implications.

The subjects that are likely to be effected by these technology changes are teaching in IT, business studies and medicine. If Japan follows the experience of other countries the early applications are likely to be at postgraduate levels rather than undergraduate levels. This has the advantage that the student groups are smaller and the projects in new methods can be controlled more easily. Also re-training subject areas are likely to be specialised and therefore relevant to the postgraduate study topics in the universities. Also the universities can respond with new courses etc. in the postgraduate areas more rapidly. The advent of broadband in the near future will add stimulus to the use of videoconferencing techniques that to some degree can emulate face-to-face teaching and tutorials. The most common mode of teaching in traditional universities for very many years has been face-to-face and this is the mode that most university teachers are familiar with. It is the younger teachers who are more willing to experiment with new methods. If they do not have the interest and support of their senior professor it is difficult for them to progress.

The new autonomy that the Agency Status will give national universities will allow them to set up their own support centres and introduce new network technologies more easily, and a small number of universities have already made such moves. The status of the people who staff support centres will have to be considered.

These are people who can command quite large salaries around the world and in Europe and North America are in short supply. In those countries because they have skills required by the commercial sector they can command salaries in excess of those in the academic posts.

There is a need for quality control of educational material produced by and for the new technologies, especially if the material is to be used for distance learning outside of Japan and where quality control has to be maintained across boundaries. Pedagogy has to adjust from the methods associated with the traditional methods of teaching to the new technologies because although the effectiveness of the teaching is the prime consideration the way this is achieved may change significantly.

An important factor in higher education for Japan is the attitude to the English language. Many Japanese people find it very difficult to learn English and there are many fundamental differences in the languages. However the strength of English because it is a world wide commercial language means that Japan will have to be prepared to use and produced teaching and learning material in that language if they are to have an impact in the global educational market. The importance of having teaching material in English is particularly important in the postgraduate area as it is more specialised. Japan would like to be a force in South East Asia and English is a common language throughout that region and throughout the Pacific Rim.

Acknowledgements

The author wrote this report whilst working as a Visiting Professor at the National Institute of Multimedia Education (NIME) for 3 months from 7th May 2001 to 7th August 2001.

The visit was supported financially by NIME and made it possible to visit a number of Higher Education establishments in various parts of Japan. These visits included both national and private universities.

The author would like to thank all those people working in Higher Education in Japan who agreed to give their valuable time to be interviewed, especially as the interviews had to take place in the English language.

The staff at NIME helped organise the visits to the people listed who were interviewed and made it possible to attend as an observer the 7th OECD/Japan seminar on E-Learning in Post-Secondary Education - Trends, Issues and Policy Challenges Ahead from 5-6 June, 2001 in Tokyo, and the ITHET-2001 Conference (Information Technology Based Higher Education and Training) from 4-6th July 2001 at Kumamoto.

The author would like to acknowledge the help of all the member of the staff of NIME, especially Prof. Takashi Sakamoto, Director General of NIME, Prof. Dr. Kimio Kondo, Executive Director of the Research and Development Department and Prof. Kobayashi. Also the kindness and assistance of Ms. Katagiri, Ms. Sato, Ms. Hirai and Ms. Miyake, who in many ways made his stay in Japan a very happy experience.

BACKGROUND

1. Project Objectives

The following statement describes the relationship between education and technology: -

> Education is the building of a rounded individual who can assess facts, hence gaining knowledge to enable him/her to interpret and use it to the advantage of the individual and the community. A full education is aided by an understanding of the history of the subject to learn why and how we have reached our present state of knowledge. An appreciation of the Arts helps to understand how the emotions and senses are involved. An appreciation of Science fosters the ability to experiment and observe the results, and from these to make deductions and predictions on how the knowledge will develop in the future. Technology is the application of our scientific knowledge to every day living.

The technology most commonly linked with education is Information and Communications Technology (ICT). Examples of Communications Technology include digital networking, television, and mobile telephones. Information Technology permits sophisticated interactive use of the World Wide Web (WWW). Education has recognised the value of these technologies and web-based learning, electronic mail and videoconferencing are all commonplace in Higher Education institutions.

Financial support to produce this report came from two main sources, University College London and the National Institute for Multimedia Education (NIME) in Japan. In total 40 people were interviewed, coming from University College London, other universities throughout UK, various private and national universities and institutes in Japan, a selection of universities in Europe and senior officials in the European Community.

This report reflects the comments made by the interviewees, not the opinion of the author. In some places there are diverse comments on a particular topic and these reflect the diversity of views of those interviewed. Comments have been modified to remove detailed references to an individual's place of work.

2. Interview Procedure and Analysis

2.1 How were people chosen to be interviewed?

The interviewees were chosen from the people, who are or work with educational technologists. To obtain a balanced set of opinions these people have been chosen from several groups and from both senior and junior staff members. These groups include academic teachers and Heads of Department. They include technologists whose function in teaching and learning applications is to advise and implement the appropriate technologies. Also included are people who have experience organising grants applications and running projects. They have learnt to assess the potential value of technologies and evaluate the way they can be used in teaching and learning. Administrators have a viewpoint taking into account the requirements and priorities of an institution. People in places like the European Commission have the advantage of being involved in the planning and execution of the large European Union R&D programmes. They would be expected to have an insight into how technology fits into the overall pattern of change in education.

A list is provided of all the people interviewed and their appointment. This list with a brief curriculum vitae indicating their work relevant to the field of this report is given in Appendix 1.

2.2 How were interviews carried out?

The information for analysis was collected in two stages. The first stage was the interview itself, which normally took place in the workplace and lasted for about one hour. A Mini-Disk recorder was used which gave good quality recordings lasting up to 74 minutes. The second stage was to produce a transcription of the discussion, and store as a computer file. This was subsequently checked to ensure it was an accurate record.

Questions were asked concerning: -

1. University environment
2. Relationship between academic and technology Staff
3. e-Technology
4. Innovation in teaching and learning
5. Management of change due to the application of technology to teaching and learning
6. Strategy for quality control management
7. Staffing of support centres

In total over 100 questions were prepared and from this master-list 20-25 questions were selected for each interview. These selected questions were available to be used as required but there was no intention to stick rigidly to these questions.

Prior to the interview each person was sent a short document describing the aims of the report and indicating the subjects to be discussed in the interview. The interviews were conducted in an informal manner and if a discussion developed upon particular topic naturally then the prepared questions were set aside. The list of available question that constituted the master-list is shown in the Appendix 3.

2.3 How was the recording of the interview analysed?

The second stage was to transcribe the recording to produce a file to be stored in the computer for analysis. Each interviewee has been assured that there will be no quotations in the report ascribing specific comments to them.

The data from the recordings take several forms as listed below: -

2.3.1 Raw Data

The digitised audio recordings of conversations between the author and the interviewees.

2.3.2 Working Data

The recordings were transcribed to produce text files of conversations that were stored on the computer. These files were first checked with a speller and areas were identified where the transcription might be incorrect because sentences did not make sense because the recording was difficult to hear, due to background noise or other problems.

Major grammatical errors in the transcription were then modified and the transcript was sent to the interviewee for their comments and corrections.

2.3.3 Condensed Data

Each transcript was approximately 14 pages thus producing a total of 140 pages of text to be analysed. This was too long to be part of the document and so had to be condensed. All of this information was the response of the interviewee to questions drawn up by the author, which are listed in Appendix 3. These questions were aimed at teachers, administrators and support workers because each would have a different emphasis on their knowledge and approach to educational technology.

2.3.4 Record of Interviews

The Record of Interviews is drawn up from the condensed data. The original information was 140 pages in length that was condensed to 16 pages.

The information has been presented under the following seven headings: -

1. University environment
2. Relationship between academic and technology Staff
3. e-Technology
4. Innovation in teaching and learning
5. Management of change due to the application of technology to teaching and learning
6. Strategy for quality control management
7. Staffing of support centres

2.3.5 Summary of Interviews

The summary is made from the Record of Interviews and is 5 pages in length.

2.3.6 Conclusions

The conclusions are the opinions of the author.

3. List of Persons Interviewed

Dr Kazuhiro ABE M.D.
Professor of Cytology and Histology, Department of Anatomy, Hokkaido University Graduate School of Medicine, Sapporo, Japan

Dr. Hidenori AKIYAMA
Department of Systems and Information, Graduate School of Science and Technology, Kumamoto University, Kumamoto, 960-8555, Japan

Dr. Makoto ARISAWA
Faculty of Environmental Information, Keio University, Fujisawa, Japan

Dr. Kikuo ASAI
Associate Professor, Research and Development Division,
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Dr. Takahiro KIUCHI, M.D.
Chairman of the UMIN, Chairman of MINCS-UH, University Hospital Medical Information Network (UMIN) Centre, University of Tokyo, Japan

Dr. Masahide KURIMOTO
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Dr. Yasutaka SHIMIZU
Director of the Educational Resources Research Centre, National Institute for Educational Policy Research of Japan, within the Ministry of Education, Culture, Sports, Science and Technology (MEXT)

Prof. Yukio TAKEFUTA
Assistant Dean, Faculty of Foreign Studies, Director, Bunkyo Language Education Centre Bunkyo Women's University, Bunkyo-ku, Tokyo, Japan

Dr. Aya YOSHIDA
Associate Professor, Research and Development Division,
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4. The Multimedia Department at University College London 1982—2002

4.1 The early scene

The period 1982 to 2002 has been chosen to demonstrate the change in the work of multimedia departments since Information and Communications Technologies (ICT) became important in higher education. ICT has had a dramatic effect on the work of these departments. Appendix 4 lists the grants awarded to the Media Unit in UCL throughout this period and the technologies that were used.

Educational technology is evolving from a simple service, moving and maintaining equipment used in lecture theatres, to an increasingly complex service supporting advanced technologies with a vital part to play providing a range educational support services. The technologist is one member of a multidisciplinary team needed to develop and implement new courseware in environments ranging from on-campus learning to distance learning anywhere in the world.

These departments were originally known as Audio-visual Centres, were small with little status. The work of the staff was primarily carrying overhead projectors from one room to another as required by the academic staff. In prestigious institutions there were large lecture theatres with projection and cinematic facilities that had to be operated and maintained. When facilities had to be refurbished, the re-designing of the audio-visual features of this teaching space would be the responsibility of the Audio-visual Centres.

In a more advanced department there might be a video production unit, and with it an associated edit suite. In some cases there was a small video studio that was moderately well equipped, but struggling to keep up to date due to under-funding. The video productions were of a professional standard and some of these university video units attained a high reputation. These units still produce high quality video programmes for archive, promotional or for teaching purposes. Their existence is under threat and in the past year 2-3 units have closed down. The video recording and editing equipment costs have reduced dramatically in recent years and video material of broadcast standard is now affordable.

In some institutions the Audio-video Centre would be linked to the photographic department that provided the specialised photographic requirements of the university. In some departments an artist was employed to design and produce artwork for academic presentations in lectures and at professional meetings. In Medical Schools medical artists played an important role alongside medical photographers in recording medical conditions.

4.2 The advent of ICT in higher education

Around 1982 in London the Charing Cross and Westminster Hospitals Medical School installed a fibre optic network linking their several teaching sites, to be used to give video lectures. A short time later another interactive fibre optic network was installed linking a number of major colleges of the federal University of London and was called the London Interactive Video for Education Network (LIVENET). The Open University (OU) through its BBC production unit was producing educational TV programmes which were broadcast as part of the content material of their degree courses, that supplemented books and documents. At this time Japan set up its National Institute for Multimedia Education (NIME) to research the use of multimedia in education, and also the University of the Air was founded - the Japanese parallel to the OU.

At the same time Computer Aided Learning, and its associated authoring systems became available, but there was relatively little interest from people in

universities. The very compact and cheap Apple micro-computer came into existence that had unique features for handling graphics. The Apple was able to control a video-tape recorder using a simple RS232 interface and this was used to develop a short training video for cardiac resuscitation at Middlesex Hospital Medical School. This was one of the first attempt at producing interactive video teaching material and it had an impact. There were drawbacks; the precision of control of the videotape was poor, the time to react to a request to start and stop was relatively long; but it did demonstrate that interactive teaching systems in the video medium were possible.

This was the time to experiment with optical technology; laser beam videodisks were possible and fibre optic communications was available. The Middlesex Hospital Medical School received funding from the UK Government, Department of Trade and Industry to produce a pilot interactive training videodisk concerning lifting and back pain, both in industry and in nursing. Even now a huge number of man-hours are lost everyday due to the back-injuries because people do not have good training about how to lift heavy objects correctly and safely. The brewery industry suffered particularly from this problem. These interactive training programmes gave us our first experience of this kind of work and its complexity. An academic project on the physiology of breathing gave early experience of a consortium of medical schools in London designing and producing visual teaching material. We had ambitious plans but slowly became overwhelmed by the difficulties in getting agreement from a committee and meeting their continually changing requirements on graphics. There were many issues related to the limited resolution of video formats compared to the printed page.

At the same time LIVENET was being developed, This fibre optic network was provided by British Telecom, with a number of analogue channels for video and digital channels for control. Each fibre multiplexed six analogue audio and video channels in and out of each site, plus a 2mbps data channel for controlling switches and remote equipment. This established the conventional arrangement of audio and video equipment at each site for video-conferencing; at least three cameras and monitors; one for the image of the speaker or teacher, one for the audience/students and the third for any piece of ancillary equipment used to display images under discussion. This ancillary equipment could be a video-recorder, an overhead projector or another camera. The network was a star configuration and at the hub was a central switch that would allow any site to be connected to any other and also allow multiple conferences to take place. This layout in each site was similar to what has been used in the more recent Japanese Space Collaboration System VSAT transmissions. As the LIVENET project developed we were able to uplink and downlink to satellite from the terrestrial network through the Telecom Tower in London, that was next door to Middlesex Hospital Medical School. (The Middlesex

Hospital Medical School merged with the University College Hospital Medical School in 1985 to form the University College London Medical School).

The video teaching network was initially expected to be used for science teaching, but as time went on classicists, historians, the medical schools were all users. The network was set up at a time when intercollegiate courses were popular. Now market forces govern us and universities compete for student and as a consequence most of the intercollegiate courses have fallen away. The network is now used principally within UCL to link the three sites of the medical school for teaching and meetings. The technology was modified because the network was expensive to maintain and some of the colleges preferred to use ISDN because it offered a service on demand. This change was made easily because the end-user equipment was the same.

At this time 'write once read many times' (WORM) optical discs became available that permitted single frames still picture or video-clips to be written to the disc at any time, without going through the very rigorous and complex mastering procedure necessary with the conventional videodisc. This allowed us much greater flexibility in preparing graphic, photographic and video material for teaching and training.

The introduction of the fibre optics was changing the work of the department and higher skills were needed to use the advanced technologies. Some of the staff were able to cope with these changes and but others were unhappy. The department changed to become two groups, one keen to be involved in Research and Development (R&D) and the other content to do routine service work. There was a positive playoff from this arrangement - the R&D staff learnt the difference between experimenting and being able to deliver their system routinely into the teaching environment and the service staff had a stimulus to work with new technologies.

Another application of fibre-optic technology was to link the video studio control room to the clinical operating theatres in the hospital and record operations taking place for teaching purposes. The optic links provided an interactive system linking the operating theatres, the control room and the seminar rooms or lecture theatres. This system could be linked into LIVENET and thus was capable of transmitting clinical operations to other parts of the world when connected to satellite uplinks.

The department became involved in the European teaching and training programmes concerned with the application of technology to education, in particular the DELTA and the SOCRATES programmes and later the Framework V and VI programmes. The early projects aimed to apply technology to link different European institutions and they were very much concerned with bringing people from different

European countries to work together. Our contribution was related to the use of satellite to transmit educational information to anywhere in Europe, and to introduce interactive techniques using two way communications. The return pathway was provided by terrestrial communications, in particular ISDN. Initially ISDN was not a reliable means of communication - frequently one of the 2 ISDN lines would crash. In those days early in 1990s we did in fact link to many different places in the world; Japan, China, USA Canada, Australia and South America. On occasion we do still use multi-national links-up and recently supported a conference linking Hong Kong, Beijing, London and Baltimore simultaneously.

Another UK technology development was to use simulated 2Mbps ISDN over the academic ATM network, SuperJANET. In a teaching project 6 major medical schools were linked to give regular lectures in surgery on a course that was part of the undergraduate curriculum. The technical provision was the same at each site so that the lecturing load was shared between the universities. The most difficult part of the project was to establish a real-time interactive environment with our colleagues and students at the other sites. At UCL we were able to use the LIVENET facilities for this project to link our lecture theatres, seminar rooms, clinical operating theatres and the WORM optical disk to display slides and video clips. Student interaction was made possible by one student acting as the spokesman for their group and handling the questions and answers. The students wanted case studies with live patient to be included in the lectures - one can regard the live patient as most fascinating example of multimedia in the lectures.

4.3 The current scene

Now the application of new technologies in teaching has moved further than simply demonstrating the ability of a technology to function in the educational environment. Most projects are directed at the courseware, with its associated technology, being used by students on a regular basis. This requires technologists and pedagogues to be working together right from the first stages of the project planning. Those centres that have achieved close collaboration between technologists and pedagogues produce good quality work and everyone has benefited. The need for multidisciplinary teams pulling together the varied skills of support centres is vital for progress.

The emphasis is on the use of networks. The bandwidth available on these networks is increasing so that the ability to handle data and text is extending to the transmission of still and moving images. The Intranet and Internet transmit data/text between web-sites throughout the whole academic community, within the institution, within UK and abroad.

Interaction between the student and the teacher/tutor or student and fellow students is considered vital to the education process and this interaction can either be time independent (asynchronous) or time dependent (synchronous). Asynchronous use includes e-mail, chat rooms and computer conferencing etc. Some distance education management systems handle administrative functions and permit tracking of student and tutor progress etc. This information is available asynchronously when the users require it.

Access to the WWW can be considered synchronous as progress through the web site depends upon real-time interaction. To provide security and rapid access many academic web-sites are supported on the Intranets using local servers and in this way persons not belonging to the university are denied access. Whereas 5-10 years ago people were keen to produce their courseware and distribute it on CD-ROM, now courseware is available on the local servers and CD-ROM is basically a transfer medium. The technology is available to handle still images and video and the demand is building up. PowerPoint has been a powerful stimulus to activity, especially as teachers can prepare their own slides and presentations. This has led to more skilled demands on the support centres, as teachers now require support for the more sophisticated facilities that are available. JavaScript animations and simulations are now being requested as WWW technology improves.

Another area of network activity in the synchronous mode is the use of video. This is used for video conferencing and video streaming. (The WORM disc used on LIVENET some years ago can be considered an analogue system that pre-dates the digital video streaming system, where pre-recorded video could be streamed over the analogue network). Videoconferencing has taken several forms, ranging from special networks such as LIVENET, ISDN telecommunications services, satellite services and VSAT, and currently there is much interest in H.323 IPv6 services. The limitations of videoconferencing technology have been principally the resolution of the signal and the associated limitations of the video format. One of the attractions of H.323 is the desktop availability but it has still to be shown to work satisfactorily in an educational environment over the broadband facilities of the national academic network. It has been possible to combine the ISDN type facilities to observe the speaker and the Internet PowerPoint facilities to display high-resolution images that cannot be transmitted over ISDN. ISDN and satellite are being overtaken by newer technologies such as IP and wireless.

The support of these services requires skilled staff who understand the technology. There are software packages, such as PowerPoint, available from major companies like Microsoft and support for these packages does not need such skilled staff. If however facilities such as video are requested then the state of the art is still

such that skilled staff have to be consulted.

4.4 The future

The future will be closely bound up with the changes taking place in universities - the changes that are going to come into effect in UK, USA, Europe and Japan.

UK universities have a large income from foreign students - students who come to study in UK. They come for a variety of reasons but at great expense. Presumably one factor is that they feel that the possession of a degree from a certain university is an asset. However if a degree credited by a reputable university can be obtained at home by distance learning methods at much less cost, then the foreign student market could change drastically. The financial implications are real to the UK universities and the problem will not go away. The solution has to be that the universities begin to operate on a global scale and it is general opinion that no single university has the resources to do so effectively on its own.

It is expected that big commercial companies concerned with publishing and communications will set up consortia with universities and operations will be on a scale so far not envisaged. The scalability exercise is a major challenge because until now most institutions have thought only in terms of their own requirements. Further the scale at which most universities have been producing new courseware has been too small to have any major impact even in their own institution. Interestingly this means a significant shift back to collaboration with other universities - in the 20 years that has been considered one has seen a move away and back to collaboration. Alternatively we will see a new phenomenon that is called by the Americans' Co-opertition'- a peculiar blend of co-operation in some things and competition in others.

When the global companies become involved with producing courseware they will set up their own facilities - so what will be the role of the multimedia departments within the universities? These departments may well be under threat of outsourcing because they will no longer be required, and if institutions are looking for space or funds these departments could be under threat. I think they will have a role - to act as the go-betweens between the academic and the commercial concerns and to interpret the requirements of the academic staff because they have a special understanding of how a university works. Some people think these risks will not effect many universities because their participation and collaboration will be in postgraduate specialist areas, where there will not be a large mass market and therefore little competition with the larger media companies.

SUMMARY OF INTERVIEWS

1. University Environment

The three important changes taking place in Higher Education currently in Japan are; -

The change in status of the national universities to agency status
Demographic changes
Introduction of ICT

1.1 Agency status

In the early 1990s the government proposed to deregulate the universities. Also it said the focus of their activities should be education. Each year the commitment of universities to education is reviewed by the Organisation for Awarding Degrees.

By 2003-5 the national universities will become agency institutions organised in a similar manner to a private company. In the new system, most of the departments' funding will depend on their teaching and their research reputation. The changes will put the private and national universities on an equal footing. To meet these changes some universities are already planning to set up support centres for the development of innovative courseware and educational materials.

Although at the present time the use of educational technology is small; it is expected in 3-5 years time there will be a much greater emphasis on the use of ICT to improve the quality of teaching and learning. Japan does not have plans yet like the e-University in UK, although it is looking closely at the roles of the University of the Air and the UK Open University.

Statistics indicate that young people in Japan are not as familiar with computers as in western countries and they do not come to university with the same expectations of IT facilities.

Recently there were 2 million of more young people wishing to come to university, but within 5 years this figure will have dropped to 1.2 million. Hence there will be competition between the universities for students. So the quality of teaching will be an important factor.

The average age of the populations is rising, the work force decreasing and the knowledge required by the population is changing with new options such as life-long learning becoming apparent.

1.2 Information and communications technology (ICT)

The government sees ICT as an effective means of improving teaching and learning in Japan's universities, however Japanese professors are reluctant to do this.

Some universities are demonstrating their seriousness about ICT by equipping classrooms and lecture theatre with PCs and setting up campus networks etc. Wireless and fibre optic networks are being installed and various e-mail and web services provided. In some case the students are being helped to buy their own computers by very generous financial terms.

1.3 Distance education

Distance education is not common in Japan because there are few mature students. The emphasis is on face-to-face teaching in the classroom. In distance education communications technology is used for e-mail, bulletin boards, chat shops, WWW and videoconferencing. These facilities can also be used equally successfully on the campus, and in many institutions this is happening.

Experience has shown that a distance learning environment needs a local tutor to give support to the student.

The teaching applications are likely to be in continuous professional development and at Master level, in subjects such as Business Studies, Information Technology and Medicine. Japan has not had MBA courses until very recently.

Some universities are re-organising their departments to interdisciplinary departments focussing on support to produce educational materials. A National Resource Centre to encourage the use of the Internet has been set up, but there is very little material for Higher Education.

1.4 Companies

The large manufacturing companies in Japan have trained their own employees for life-long employment. This relationship is changing; the population is becoming more mobile and life-long employment is breaking down for economic reasons, and unemployment is now possible. The pace of technology change is fast and the companies are releasing staff at Master and PhD level to train with the universities

1.5 Research and development

The national universities have concentrated on research, but little research has been carried out into how technology can best be applied in teaching and learning. About 20 universities are doing research into teaching that is mainly funded by the government.

Under the agency system the National Institute of Multimedia Education (NIME) will need to demonstrate its research outcomes are relevant to teaching of students. NIME will expect its R&D programme to shift from traditional media research to e-learning and the virtual university. Applications of e-learning and e-teaching are not necessarily going to be cheaper than traditional teaching.

2. Relationship between Academics and Technologists

If ICT is to be used for teaching, technical support is necessary, but this kind of support is rare in Japanese universities. There are neither support staff nor expert technologists to advise on new and innovative courseware, but a proposal has been made to the Higher Education Council that support staff should be provided for the use of ICT for teaching.

A number of universities do have plans to set up support centres when the agency system is implemented, It is possible that a consortium of universities may use support centre facilities.

The University of the Air and the broadcasting group NHK produce high quality educational programmes for radio and television. Some universities use these programmes in their teaching, and this can qualify for part of a degree course if it used under the supervision of a university.

The management objective must be to provide an efficient service for the production and development of courseware and educational material, and to provide the technology necessary for the delivery of the teaching and learning. The technologist must be part of a multidisciplinary team comprising teachers, content specialists, educational psychologists, pedagogues, and librarians and media specialists.

Japan is a country that has a strong technology base but in education it has a conservative outlook.

The technologist should be closely involved in any project because technology influences both the content that can be used and the means of delivery of the information and the courseware. The technologist's role is to ensure the technology functions in teaching and learning applications to improve the ability of the teacher to help the student to learn and acquire new knowledge.

There can be a tension between technologists and pedagogues because there is considerable overlap in their roles. Technology is always changing rapidly and it is difficult for anyone to keep up. Pedagogy has to adapt its concepts to the new ways of teaching and learning emerging from technology applications.

3. E-Technology

Flexible teaching and learning environments have been made possible by ICT applications in using the Internet, computing networks, multimedia, animation, simulation and images. The WWW has proved to be a powerful source of information and networks have provided highly interactive teaching and learning systems.

Synchronous systems using satellite or fibre-optic networks have provided real-time interactive communications and asynchronous systems such as the WWW have allowed students to work as and where they wish. Combining these has provided a flexible environment both on campus and at a distance.

The advent of broadband networks in the near future will facilitate moving images and video streaming that will have a significant impact on the quality of distance education.

Wireless networks exist in a small number of universities and these were used to communicate with students, organising the student programme and assignments etc.

4. Innovation in Teaching and Learning

At the moment in Japan most innovation in the use of technology depends upon the individual teacher. A small number of the national universities and even smaller number of private universities do provide some support facilities.

There is no innovation programme on a national scale and so the impact is small and scattered. It is hoped the agency system, by calling on universities to focus on education, will lead to the setting up of support centres.

The Japanese are looking with interest at the ideas of the UK e-university for producing educational material and courseware.

An increasing number of teachers are now using the WWW, but main disadvantage is that it is slow, not interactive enough and the quality of material and information is not guaranteed. Many systems are text based and there is an urgent need for greater imagination in the use of the WWW, and in the use of images. Most of WBTs on LAN are using images in Japan.

Japanese is a serious language barrier as few people speak it outside of Japan. English is the second language in the country but there is some worry that if it is embraced too much this will harm Japanese culture.

Courseware and information written in English is more commonly used by graduates and there are people who advocate that all courses at Master level should be in English, especially in the business and scientific fields. Unless Japanese web sites have an English version they will not be greatly used outside of Japan.

This question of language and the use of English and/or Japanese is an important issue as Japan would like to be an important player in education in Asia - it would like to see a third area of expertise set up to balance North America and Europe. Japan has pioneered the use of VSAT satellite communications for interactive teaching and the system can be extended to universities in other parts of the Pacific Rim.

5. Management of Change due to the Application of Technology to Teaching and Learning

The Japanese Ministry of Education has given a dispensation for credits achieved through distance education. Very recently this dispensation included courses delivered over the Internet.

The basic criteria to implement a course in the curriculum is how well it meets its objectives for instruction or learning, the efficiency of the methodology and its cost effectiveness.

The government has been promoting the use of ICT technology in Higher Education and it has made sure that the funds for this purpose do not disturb the main budget.

As universities will shortly be moving to an agency status, the appraisal of e-

learning and e-teaching strategies will take place every 6 years.

6. Strategy for Quality Control Management

Quality control procedures are not highly developed in Japan. There are no clear standards or criteria to assess the effectiveness of Higher Education, other then the review each year by the Organisation for Awarding Degrees. Some international professional organisations such as the Institute of Electrical Engineers do have standards and approve courses, which meet those standards.

Studies are only just beginning on the effect of ICT on cognitive thinking and subject achievement. Successful innovation is judged to increases effectiveness and is measured by improvement in student performance. Most people assess the success of new teaching or learning methods by the comparison of the performance of students taught by traditional methods with those who have been exposed to the use of technology.

Traditionally Japanese students are not accustomed to providing feedback on their lectures or the subject content of their courses.

7. Staffing of Support Centres

Japanese lecturers do not have tenure.

There is a strong emphasis on having the right qualifications and the prestige of the university where the first degree was obtained.

Currently there is no establishment position for educational/instructional designers, but there are people lobbying to set up Educational Support Centres to assist the introduction of ICT.

CONCLUSIONS

These conclusions are the opinion of the author. They are influenced by his experience learning the opinions of the people interviewed, together with his experience as a university lecturer, a project leader and as manager of a support centre.

1. Changes in Japanese Universities

1.1 Currently there are a number of important changes taking place in Higher Education in Japan. Probably the most far reaching is the change of the national universities to agency status to be implemented by 2003-5; that will mean that national universities manage their own affairs and compete on more equal terms with the private universities. These changes were first discussed in the early 1990s. Organisations like the National Institute of Multimedia Education (NIME) will need to demonstrate its research outcomes are relevant to teaching of students and NIME will expect to shift its R&D programme from traditional media research to e-learning and the virtual university. It is wrong to expect e-learning and e-teaching to be cheaper than traditional teaching.

1.2 The government seems to see ICT as an effective means of improving teaching and learning in Japan's universities, however Japanese professors are reluctant to do this. At the present time the use of educational technology is small but it is hoped this will have expanded greatly in 3-5 years time. Japanese students are not as familiar with computers as in western countries and they do not come to university with the same expectations of IT facilities. The Open University in UK is seen as paradigm for the application of new technologies. Wireless and fibre optic networks are being installed and various e-mail and web services provided.

1.3 There are forecasts that there will be a 40% drop in undergraduate students due to demographic changes; as a consequence the universities are beginning to seek new kinds of students from different parts of the population. The average age of the populations is rising, the work force decreasing and the knowledge required by the population is changing with new options such as life-long learning and continuing professional development becoming apparent. The concept of distance education to meet these changes has not received general acceptance.

1.4 The Ministry of Education has now agreed that some credits for the degree can be obtained by studies taking place by distance education techniques and by use of the Internet. Each year the Organisation for Awarding Degrees will review the

commitment of universities to education. Initially innovative teaching applications are likely to be in continuous professional development and at Master level, in subjects such as Business Studies, Information Technology and Medicine. (Japan has not had MBA courses until very recently).

1.5 The large manufacturing companies in Japan have trained their own employees for life-long employment. This relationship is changing; the population is becoming more mobile and life-long employment is no longer guaranteed, and unemployment is now possible. The pace of technology change is fast and the companies are seeking collaboration with the universities, especially at Master and PhD levels.

2. Introduction of ICT in Japan

2.1 One major drawback in the introduction of ICT will be that very few universities of any kind have support centres to develop and deliver education using new technologies, although most universities operate their networks through Network Centres and give assistance to faculties..

2.2 There are very few support centres dedicated to the production of courseware in Japanese universities. This lack of specialist expertise to produce multimedia materials is holding back Japan's ability to take part in the global educational economy, to produce and sell courseware, resources and facilities. Support centres modelled on those in US universities or the Open University (OU) in UK will be necessary, with multidisciplinary teams comprised of technologists, pedagogues, networking support staff, librarians etc. The Japanese universities are more likely to look to North America for new ideas. However a number of people in Japan are aware of the work of the OU and hold this in high respect, such that a number of the staff of NIME have visited the OU in United Kingdom.

2.3 At present there is no career structure for the staff of these centres; whether they should be academic or administrative. Experience in North America and Europe has shown that these people can command high wages, possibly higher than academics and there are not many available.

2.4 There can be a tension between technologists and pedagogues because there is considerable overlap in their roles. Pedagogy has to adapt to the new ways of teaching and learning emerging from technology applications but at the same time technology is changing rapidly.

2.5 Support centres may be affiliated to a particular university or to a consortium to serve a region. The teacher will be a key person in this organisation, but there will be a shift away from face-to-face teaching to the use of the WWW and videoconferencing techniques. Japanese universities already have a sophisticated interactive satellite system (SCS) using VSAT channel control technology linking over 150 universities. This has been used for three thousand hours per year for collaborative activities including course exchanges, as the need to collaborate with other universities had been limited. The advent of broadband networks and desktop videoconferencing is likely to cause people to re-think their priorities especially if Japan is to be involved in teaching over the whole of SE Asia. .

2.6 A National Resource Centre has been set up to encourage use of the Internet, but there is little material for Higher Education. The national universities have done little research on how to apply technology in teaching and learning. (Only about 20 universities are doing research into teaching).

2.7 Most innovation in the use of technology in Japan depends upon the individual teacher. A few national universities and even fewer private universities do provide any support facilities. There is no national innovation programme and there is nothing comparable with the e-Universities in Europe that commissions the existing universities to collaborate to develop new courseware.

2.8 The University of the Air and the broadcasting group NHK produce high quality educational programmes for radio and television. Universities use these programmes in their teaching, and they can qualify for part of a degree course if it used under the supervision of a university.

3. English Language

3.1 English is the second language in the country but there is concern to protect Japanese culture. Postgraduates studies use English especially in the business and scientific fields. This question of the use of English is an important issue, as Japan wishes to be an important player in education in SE Asia; to be a third force to balance USA and Europe.

3.2 The VSAT satellite communications system can easily be extended to universities in other parts of the Pacific Rim.

4. Quality Assurance

4.1 Quality control procedures are not highly developed in Japan. There are no clear standards or criteria to assess the effectiveness of Higher Education, other then the review each year by the Organisation for Awarding Degrees.

4.2 Traditionally Japanese students are not accustomed to criticising the content of their courses, the quality of the teaching or the teaching and learning facilities provided. In western universities this is a well recognised methods of obtaining feedback.

RECORD OF INTERVIEWS

All comments in this section have been made by the people who have been interviewed and are not the opinion of the author. There were 10 interviews each lasting approximately one-hour, giving rise to over 140 pages of text. Here this information is condensed to 16 pages.

The questions and responses are taken from the verbatim scripts of the interviews. The section on the Interview Procedure and Analysis (page 8) gives details of how this record was derived from the original recordings. Each paragraph records an individual response of the people interviewed. Neither the identity of the person or their institution is directly indicated.

Each interview lasted approximately one hour. The audio recordings have been used to produce verbatim script which have been returned to the person interviewed for correction and comment before being used in this document.

There will be some repetition as the same answer has been given to some questions by different people. Other questions have produced a diversity of comments reflecting the diversity of opinion.

Each section (1-7) includes a short paragraph in italic type indicating the kind of information sought.

1. University Environment

This section seeks to record the responses of the staff in universities to various aspects of technology applications to teaching and learning. The staff include teachers, tutors, support centre staff, administrators and people in key positions in organisation like the European Commission. The answers were to general questions aimed at seeking information about the attitudes of university staff and the background to these attitudes.

1.1 Changes in higher education and the advent of e-learning and e-teaching

Currently the three most important changes in Higher Education in Japan are: -

1. The introduction of ICT that will result in changes in the way we teach and learn
2. Demographic changes in the age of Japanese population

3. The change to agency status of the national universities that will place the national and private universities on a more equal footing

The government sees ICT as an effective means of improving teaching and learning in Japan's universities, and it is hoped that it will be taken up widely. However Japanese professors are reluctant to do this and Japan is behind other well-advanced countries in using IT in classrooms.

Most Japanese professors now use overhead projectors and video, but those who use CD-ROMs and DVD in their classrooms are very few. Very recently there has been a major shift to the use of the Internet in both teaching and research.

Several years ago there were 2 million of more young people wishing to come to university, but now in 6 years this figure will have dropped to 1.2 million. Hence there will be competition for students between universities and it will be very important for them to provide good teaching. There is a second demographic change in that the average age of the populations is rising, the work force decreasing and the knowledge required by the population is changing with new options such as life-long learning becoming apparent.

These changes began in the early 1990s when the government proposed to deregulate the universities and make them take charge of their own affairs. They said the universities should focus on education, because universities teachers had seen themselves as researchers rather than teachers. The universities have to show a commitment to education, and their activities are reviewed each year by the Organisation for Awarding Degrees.

E-learning can be divided into two categories, distance learning and the use of the World Wide Web. Distance education is not common in Japan because there are few mature students in the universities. The emphasis is on face-to-face teaching in the classroom or lecture theatre. It is likely that more mobility and the concept of life-long learning will slowly change attitudes to distance education. In this context distance education refers to education which is carried out remotely; it can be within a campus, between campus and individuals linked by the Internet and can provide varying levels of support for the students involved.

These changes have resulted in modification of the conditions to obtain a degree; the government has changed the rules so that distance education is permitted and up to 60 credits out of 124 may be taken by distance education methods. Courses are appearing in university to benefit by these rule changes and they may increase quite rapidly. It takes about 6 years to prepare such courses. Engineering is one subject

domain where this is happening and there is special interest in remote laboratories. One important result of using educational technology is that the ways of presenting the information/content of a course can be considerably increased and students can be given new experiences and options.

Another change is that some universities are re-organising their departments, and departments have combined to become multi-disciplinary focussing on information technology. Some members come from Computer Science and some from sociology and economics. These new types of departments are currently very popular and graduates from these departments seem to be able to get jobs quite easily.

The National Institute for Educational Policy Research of Japan is starting a Resource Centre that will encourage the use of the Internet for the whole range of education from Primary to Higher Education. The Internet can support the synchronous real-time and interactive environment of a conference or tutorial and operate in the asynchronous demand mode which makes knowledge and information available to a very large number of people at a time of their own convenience - it is a ubiquitous solution. There is very little material for Higher Education and also very little of it is written in Japanese - most being written in English. A small number of professors with experience of developing courseware running on the Internet are being commissioned to produce more material.

If technology is to effect teaching and learning in a positive way we will need to develop teaching systems, and their effectiveness will depend on the educational content, the technology used and the student motivation. The technology system will have to be generic so that it can keep pace with changes in technology. Any changes will require money both to upgrade the teaching centres and the remote sites. The design of a successful and flexible system will depend on discussion and collaboration between educators and system designers/engineers. The demands and expectations of the students will also influence this. There are some statistics, which indicate that young people in Japan do not have as much exposure to computers as in western countries and they do not come from school to university with the same expectations of IT facilities.

It is desirable that the changes produced by the e-teaching and e-learning should not be too rapid and drastic otherwise they will frighten those professors who do not wish to adopt innovative teaching methods and ideas. The Internet provides a very powerful source of information and knowledge, but students need to be trained to use it effectively and to be a good judge of the quality of the information they find. The choice of technology to use in different applications demands an expert knowledge and also an understanding of the potential of a technology to develop in the future.

Applications of e-learning and e-teaching are not necessarily going to be cheaper than traditional teaching. Each institution will find the extra costs in their different ways. At present in the national universities proposals using multimedia to improve the quality of teaching are made to the Ministry of Education, Culture, Sports, Science and Technology (MEXT). If MEXT approve, the government provides the extra money. In the case of private universities, they also can propose a project to a special foundation that supports private universities and this may be granted on the basis of matching funds.

Some people feel only a small number of centres should be using e-technology and these are the people who are really interested and know what can be achieved. These experiments should be on a limited scale because the teachers at this time do not know what can be done. There is a need to demonstrate what can be achieved. It is anticipated that in due course 40% of the professor will use technology in their teaching, and by the time 20-30% have changed to using technology it should be being used effectively in the universities. The uptake will vary and it is possible that some of the older professors will dissuade the younger faculty members working under them to take an interest in the use of multimedia. The National Institute of Multimedia Education will expect its Research and Development programme to shift from traditional media research to e-learning and the virtual university.

Some universities are demonstrating their seriousness in embracing ICT by equipping classrooms and lecture theatre with PCs and setting up campus networks etc. Wireless and fibre optic networks are being installed and various e-mail and web services provided. In some case the students are being helped to buy their own computers on very generous financial terms.

Japan sees itself as a leading player in Asia in Higher Education and various methods are being used to involve Japanese universities with other parts of Asia and the western world. Faculty staff can be recruited from all over Asia and there are links with European and North American universities. The use of English is an issue as there are mixed feelings to using courseware written in English or having to translate it into Japanese. It will be very difficult for Japan to export courseware and also difficult to avoid buying in courseware in specialised subjects.

The overall trend through all of this is the conclusion that the Japanese professor is a conservative person and will err on the side of caution. They believe that e-technology can provide support for teaching and learning, but it is not the solution to providing the motivation for innovation and improvement in learning and teaching.

1.2 Meaning of the terms "e-technology" and "e-university"

The term e-technology refers to technologies which rely on digital techniques and methods developed in Information Technology. The most relevant example is Information, Communications and Technology (ICT). This facilitates teaching and learning, and is applicable both on the campus environment as well as remotely.

The term e-university refers to a university, real or virtual, which uses digital techniques and methods. The e-university in UK does not propose to have students and its main function is to produce courseware and establish quality control procedures for courseware and resource material that need e-technology to function.

Teachers of English in Japan want to drastically improve the present situation by the collaboration of a great number of teachers, good software specialists and plenty of money to develop the software and produce the CD-ROMs.

1.3 Agency funding for national universities

The Japanese government is promoting the idea of Agency Funding (which is popular in UK, USA or other countries). By 2003-6 the national universities will change from direct government funding to become agency institutions organised in a similar manner to a company. This is an attempt to breakdown the conservative attitudes of the university sector. There are 99 national universities totally supported by the government through the Ministry of Education.

This change will effect all decision-making; universities will apply for their funds from the government together with funds from other agencies, and how this money is spent is the responsibility of the university. In the old system the greater part of funds came automatically and so professors did not have to compete for that money, although they have to apply and compete for the funds for their research. In the new system, most of a department's funding will be determined by its teaching and research reputation. Under the old system the university had the right to decide how to spend its money from the government, within certain rules. In the new system there will be money from other sources and greater freedom on how to spend their resources.

Although at the present time the use of educational technology is small; it is expected in 3-6 years time that there will be a much greater emphasis on the quality of teaching and learning and the use of ICT.

These changes will place institutions in competition with each other and the

staff are finding it difficult to adapt. Research and Development institutions, such as the National Institute of Multimedia Education (NIME) will need to demonstrate their research outcomes are relevant to teaching students. There are people who argue that such institutions are not needed, as they do not teach students directly. It is likely that some institutions may integrate or be absorbed into universities - the future at this stage is uncertain. At the present time Japan does not have any concrete plans yet for an institution like the e-University in UK, although it is making a careful comparison between the Japanese University of the Air and the UK Open University.

These changes only affect the national universities, and not the public and private universities. The changes will put the private and national universities into more competition with each other. It is likely that the number of private universities may drop, but those with a strong financial basis are confident of their future. They have experience of obtaining and handling their own finances and they argue the national universities lack this experience. The cynics believe there will be little real change and the national universities will still receive the same amount of money.

Some universities are already planning for these changes and advertising for academic staff to set up Education Support Centres as part of their academic infrastructure. A few universities have been longsighted enough to have already top-sliced their income and set up centres to look at the role of pedagogy and technology in their teaching and learning. They are also exploring the relevance of distance education to their operations. In the field of medicine this coincides with attempts to establish a core curriculum for medicine throughout the whole of Japan.

1.4 The role of the companies

The large manufacturing companies in Japan have trained their own employees for life-long employment, and this has been very successful to the economy as seen by the world dominance in the audio, video industries and the motor industry.

Technical development programmes have been conducted within the companies and there has been little collaboration with the universities. This relationship is changing; the population is becoming more mobile and life-long employment is breaking down for economic reasons, and unemployment is now possible.

The pace of technology change is fast and the companies find it costly to train staff who may not stay with them for long, so they are turning to the universities for assistance. Collaborative relationships between universities and companies are increasing and staff at Master and PhD level are being released to either work part-

time in the universities or full-time for a period of one or two years.

There does not seem to have been much exchange of ideas and experience between the training schools in the companies and the universities about the application of the their audio and video technology in education. The Japanese have worked very successfully at system design as instanced by the Shinkansen high speed trains, but there has not been any effort to introduce this methodology in education to improve teaching. Also there is little sponsorship of laboratories and teaching centres by Japanese companies. This was done 10-16 years ago but is not common now, in contrast to the situation in Europe and North America.

1.5 Remote and campus education

In general people accept that if an institution is involved in distance education then there must be some communications technology involvement to make it possible. The speed to exchange information and the level of interaction, determine whether synchronous or asynchronous technology is required. If low cost is important then usually e-mail, bulletin boards and chat shops are used which operate with asynchronous methods. Teachers have not been quick to recognise that much ICT technology can be applied equally successfully on the campus, and in many institutions this is beginning to happen.

Remote education can be delivered synchronously through real-time interactive technology that can include audio or video conferencing. The main drawback of this method is that the students and teachers have to be available at a fixed time and the number of people who can be involved in an interactive session is limited in practical terms. Asynchronous methods are popular; particularly to access web-sites on demand and for computer mediated conferencing that does not have to happen in real-time.

Some of these students have to study alone and the use of the communications networks has made it possible for virtual learning communities to grow up. These facilities are the basis of a ubiquitous learning environment that is the dream of some educators. Distance education teaching centres are learning that unless an organisation is set up that gives student support, if possible a local tutor who the student can meet from time to time, the achievements of the students are less successful and in many cases they give up studying.

Most university teachers assert that face-to-face teaching is the best and compare any new innovative methods with this mode of teaching, even though very university graduate is likely to have experienced poor lectures during their

undergraduate course. The principal value of the face-to-face lecture is the opportunity for personal motivation from a person who is charismatic, stimulating and a recognised expert in the subject.

Japan is making a bid to be a big player in education in Pacific Asia, and in this region distance education could be important. Asynchronous methods are available and Japan has also pioneered successfully the use of VSAT satellite communications for interactive teaching by setting up a network linking 130 universities. This system can easily be extended to other parts of the Pacific Rim.

The applications areas are likely to be in Continuous Professional Development and at Master level, in subjects such as Business Studies, Information Technology and Medicine. It is interesting to note that Japan has not had MBA courses until very recently and Japanese people who have the MBA have studies in North America, Australia or Europe.

1.6 Role of research and development (R&D)

Some Japanese universities have good computer science and engineering departments and they are developing applications of technology for e-learning, e.g. network technologies, software platforms and management systems. However there is a need for research and development effort to learn how these technologies actually perform in teaching and learning applications. Work is being carried out in Japan to find out how technology can support and improve university education.

All teachers are beginning to recognise the importance of teaching well and that helping the student to learn successfully is part of their work. The national universities might be supposed to be where research is carried out but there is little research into how technology can best be applied nationally in teaching and learning, although considerable research has been done in the engineering faculties. Only 5-6 private universities are engaged in research about teaching methods, and together with the work in national universities this means about 20 universities are doing research into teaching. This work is mainly funded by the government.

2. Relationship between Academic and Technologists

This section is concerned with the relationship between academic staff and the staff working in the support centres, in particular those who worked both in the preparation of courseware and education materials and those involved in the delivery

of courseware.

2.1 Educational support centres

If ICT is to be used for teaching, technical support is necessary. This support may allow programmes to be delivered by satellite, the Internet or other technology. Supporting staff will be needed to design and make teaching materials, and staff specially trained in the use of authoring systems are required to design and draw up teaching programmes. If animation is required in web-sites a person competent to write software in JAVA is needed. None of this kind of support is available in most of Japanese universities. Whereas these people are available in North America, Australia and Europe and these countries produce much educational software, the lack of these facilities will make the Japanese professors uninterested in changing their methods of teaching. Where there is a professor who is determined to use new technologies it has only happened because he has persisted on his own with the help of some of his students.

In North America and Europe the post of instruction designer (as it is called in USA) is a recognised role. The role exists in the training schools of Japanese companies, but in most Japanese universities there are neither support staff nor expert technologists to advise and produce new and innovative courseware. A proposal has been made to the Higher Education Council that supporting staff should be provided for the use of ICT for teaching. The professors have the knowledge but currently the means of making it available as high quality teaching material is very limited.

There are facilities in most universities such as libraries, media centres, audio-visual centres and teams maintaining computer networks, but very little support to improve teaching and learning. If staff are brought into the universities to fulfil the role of a technologist or pedagogue, they are employed in posts classified as part of the administration. This means the position of the teacher is much stronger than the technologist or pedagogue, and they are usually not very experienced in the use of technology so it is hard to set up successful teams. Consequently because the push for change becomes weak and in the end very little happens.

In some national universities innovative teaching and learning ideas have developed into proposals which have been funded by the government; the funds being used both to hire staff and by equipment. In the case of the private universities they have also applied for external funding to carry out projects, but usually they are not successful at obtaining the same level of funding. The University of the Air and the broadcasting group NHK do produce high quality educational programmes for radio

and television. Some universities use these programmes in their teaching, and this can qualify for part of the credits for a degree course if it used under the supervision of a university. The public may watch these programmes, but only for their own pleasure.

Japanese professors generally are loath to use educational material produced by someone else - they see it as competition with their own course. With the advent of the agency system and the government focus on education in universities this could change and it will be easier to make new materials. One plan beginning to start next year is that the National Institute of Multimedia Education (NIME) tries to support the activities of different universities and arrange co-operation between universities. The areas that need particular attention are English as a Second Language, Business Education, Informatics, and introductions to advanced technologies. A number of universities do have plans to set up support centres when the agency system is implemented. In some areas the proposal is that the support centre may be situated at one university in the area, and the facilities be used by the consortium. One major university is advertising for a professor and two associate professors to set up a support group and do research into the application of new technologies.

2.2 Educational support centre management

The management objective must be to provide an efficient service to the academic staff. This service should include the development and production of educational material and courseware, and to develop and maintain the technology applications where necessary for the delivery of the teaching and learning. This is a multidisciplinary undertaking and the first priority must be the organisation of the staff to work together as successful teams. In UK the centres which have been successful at forming multi-disciplinary teams have produced successful and innovative products and systems. These teams have a culture where everyone is respected for their experience and expertise, and also they all contribute to planning and discussion. Members of the team can express their opinions, even outside of their own speciality; because bringing new approaches to a subject can stimulate innovative ideas.

2.3 Relationship between technology and pedagogy

Japan is a country that has a strong technology base, yet it is surprising that in education it has such a conservative outlook. If technology is not immediately successful and it proves difficult to use, yet it is evident that it has potential, we should study carefully how it works in teaching and learning in pilot applications. Successful use of a technology depends on the ability of both the teacher and the

students to be motivated to use it. Strangely Japanese teachers have some difficulty in understanding the idea of applying technology to education and they are unfamiliar with the word 'pedagogy'.

The technologist should be involved at the very beginning of any discussion involved in setting up a project. The prime objective at that stage is to decide what requires to be done and who should do what. On some occasion the planning consultation may determine that the technologist is not required to be active until the project has reached a certain point in the future. The absence of the technologist at this stage runs the risk of the wrong technology being used, having the wrong expectations of what the technology can do, and producing content which cannot be used effectively by the technology.

It is important to realise that the technology used in a project can influence both the content that can be used and the means of delivery of the data/information and the courseware as the two are very closely linked. This can be a positive influence opening up possibilities of content material that the teacher was not aware of or did not have the ability to use.

The objective of a technologist is to harness technology so that the way if functions in teaching and learning applications improves the ability of the teacher to help the student to learn and acquire new knowledge. The term technologist is synonymous with that of Instruction Designer used in North America and such people are rare in Japan. There are some professors trying to use IT in classrooms and there are some researchers trying to establishing new systems in the universities.

There are many technologies that can make a contribution to education and the Internet is widely regarded as the most important. Until broadband networks are generally available the Internet cannot realise its full potential, as one of the restrictions of the Internet is its slowness and consequent limitation on the amount of data that can be transmitted.

2.4 Teamwork - role of technologists and pedagogues

The technologist cannot work in education on his own. He or she must be part of a team comprising teachers, content specialists, educational psychologists, pedagogues, and librarians and media specialists. Ideally he or she should have an understanding of educational concepts and philosophy, and the practical aspects of teaching in the classroom or lecture theatre together with an understanding of the issues which confront the student learning on his/her own.

It is not unusual for there to be a tension between technologists and pedagogues because there is considerable overlap in their roles and neither has a long history of successful use in teaching and learning. Technology is always changing rapidly and it is difficult for anyone to keep up. Pedagogy has to adapt its concepts to the new ways of teaching and learning emerging from technology applications.

The ability to work as team is crucial to the success of the educational support organisations. The open team collaboration discussed in the section on Support Centre Management (2.2) seems to provide most success. In many centres the collaboration is more limited and what really happens is that all members of the "team" work on the project, but separately within their own speciality. There is a jealousy about ones own speciality and expertise that makes it difficult for others in the team to comment and make suggestions.

In Japan one private university has adopted the Open College ways of working and teaching and organisational matters are discussed in multidisciplinary teams, including teachers, technologists, undergraduates and postgraduates. Every one is allowed to express an opinion and is listened to. This culture has been adopted from American universities and seems to be successful. The same culture exists whether teaching or carrying out projects.

The teaching staff are the key persons in a teaching or learning application. They should have a clear objective of what information and knowledge they wish the students to attain. They should have ideas on how to accomplish this and how to make it effective. The technologist should advise on how the technology should be used, what the technology can do and how best to do it. The pedagogue should advised how best to accomplish this given the complexity of different modes of teaching and learning. The pedagogue can also advise on how to evaluate and determine the outcomes of a project or teaching/learning regime.

Another requirement of team working is that the concept underpinning the project should not be regarded as the "property" of any one person. This is a difficult idea for academic staff to accept, but this has been shown to work very effectively in the UK Open University. It results in the project being less dependent upon individuals who may come and go, but the project can move steadily forward to meet its deadlines.

3. E-Technology

Information technology provides new methods of handling and storing

information and communications technology allows this information to be moved around both within an institution and between different institutions. The questions and answer in this section are concerned with the technologies that are used or that have potential for use in education.

3.1 Information and communications technology (ICT)

The application of ICT has given rise many interesting innovations in education that include the Internet, computing networks, multimedia, animation, simulation and the various use of images. Authoring systems are a development of these technologies to provide a tool for handling them effectively. The virtual classroom (SCS) and virtual reality applications are efforts to bring several technologies together to provide flexible teaching and learning environments.

The choice of technology for a particular project is often largely a matter of trial and error, depending primarily on what facilities are available. More often the technologies available are related to communications networks or the Internet. These networks can be expected to be used as education is concerned with communication between people, either broadcasting information to large numbers of people or generating knowledge by discussion and exchange in small highly interactive groups. Web sites designed specifically for education purposes on the World Wide Web, accessed through the Internet, have proved to be a powerful and very flexible source of information.

3.2 Hybrid technology - synchronous and asynchronous modes

Facilities like the virtual classroom make use of more than one technology. In the Space Collaboration System (SCS) the pictures of the teacher are transmitted by VSAT and broadcast to a number of sites, feedback comes only through the VSAT. Fibre-optic networks provide a similar functionality. Several technologies can be combined to produce a more flexible teaching environment, for example high-resolution images can be transmitted over the Internet, and ISDN links used for audio and low resolution video link.

It is desirable to give students the opportunity to work on their own seeking data and information, and then come together with the tutors and other students to discuss how to use the information. This requires an asynchronous facility such as the Internet while seeking the information and a synchronous facility for discussion - this may take place in face-to-face mode on campus, on it may involve video or audio conferencing to include remote students. This again is brought about by a combination of technologies.

3.3 Use of moving images and broadband

Technically it is possible to transmit and receive moving images routinely. It is not yet practical to transmit moving images over the Internet because the bandwidth is too low. The advent of broadband networks in the near future will make it possible to overcome this problem. The broadband networks are expected to be available in Japan by 2006. This advance could have a significant impact on the quality of distance education.

Most Japanese universities teachers, covering a wide range of subjects from science and engineer to languages, have expressed an interest in the use of moving images in their teaching. In the sciences moving images permit tasks and processes to be demonstrated, in languages the visual image can play an important part in providing background information about the person or topic of conversation which helps understanding and interpretation.

Some universities record their lectures so that the student who has missed a lecture for whatever reason can catch up by using video-streaming technology. In Japan lectures are typically 90 minutes and this is too long a time to sit in front of a computer screen. Methods are being devised to break the lecture into smaller modules and using speech activated searching. This type of tool is very useful for revision.

3.4 Networks for teaching and organisation

Three main network technologies were discussed, satellite (SCS), fibre optic and wireless. The SCS network used advanced technology and this Japanese mesh-type video network links 130 sites in universities all over Japan by satellite. The system is interactive and based on the concept of virtual classrooms. Fibre-optic technology was used for most campus networks, but it was surprising how recent some of the installations were. Wireless networks exist in a small number of universities and these are used to communicate with students, organising the student programme and assignments. The campus wireless network was used as part of the Internet to access information and for e-mail. (Some radio systems are used to connect the remote campuses.)

4. Innovation in Teaching and Learning

This section is concerned with the experience of those who have tried to introduce innovative methods using technology into their teaching. Teachers claim

they have little time and the production of multimedia material is time consuming. So innovation will require expert support and assistance to take an idea to the implementation stage. The production of multimedia teaching materials should be content led and use good technological techniques. The drive to innovate often comes from the bottom up until there are successful exemplars and then the management may give support to projects. Early 'pioneers' often worked against serious difficulties of finance and facilities, and often on too small a scale to make an impact.

4.1 Innovation

In Japan most innovation in the use of technology and the production of teaching materials depends upon the individual teacher who is sufficiently motivated. A small number of the national universities and even smaller number of private universities do provide some support facilities to help in these efforts. Most of the technical assistance has come from other members of the department with expert knowledge, or from students. Few of the people working in this way have had pedagogic advice, which partly explains the difficulty some academic staff have of knowing what pedagogy is about.

This does not mean that no innovative work is being done, it would be more correct to say that it has not been organised on a national scale, the impact is very small and scattered around the universities. It is hoped that when the agency system has been introduced that the interest and focus on education in Japanese universities will lead to setting up a number of support centres. This in turn should lead to more innovative projects and in turn more products. The Japanese are looking with interest at the ideas of the UK e-university as an umbrella organisation for producing educational material and courseware for e-teaching and e-learning on the scale necessary to have a real impact on Higher Education.

There have been some large-scale government funded projects such as the SCS project for use of VSAT satellite technology and this does involve 130 university sites providing an interactive synchronous facility. Some people see this as a version of video-conferencing, which does not give credit to the quality of the pictures that are available and the interactive capability. ISDN videoconferencing cannot provide the picture quality, but it can provide an on-demand low-cost video link for those centres that are not part of the VSAT network.

This network was set up as to enable Japan to communicate with its colleagues in the Pacific Rim using an experimental satellite system, and was not designed as a showcase of Japanese technology. Some educators are dismissive of the use of synchronous video links, but it is interesting to note the number of people who are

now considering IP video links on the Internet.

4.2 Web-based systems

There are still many Japanese teachers who still only use textbooks, but an increasing number are now trying the WWW. Web based teaching and training systems are used in Japan where it is necessary for the student to seek out information and knowledge, whether attending a campus university or whether studying by distance education.

Feedback can be obtained using web-based system with an automatic response system or automatic evaluation system as this lessens the burden on the teacher. If the feedback system is real-time then the teacher can intervene and answer questions.

The main disadvantage of the WWW is that it is slow, the interactivity is limited and the quality of material and information is not guaranteed. Consequently it is easy to waste large amounts of time on the WWW unless well directed or using specially prepared web site for the course.

4.3 Role of English language

Japan has a serious language barrier for few people outside of Japan can speak Japanese. Japanese people do not find it easy to pick up other languages and in general are reluctant to study in other languages. English is the second language in the country because it is an international and commercial language, but there are big differences in the structure of the two languages and this difference extends to our cultures. There is some worry in Japan that if they embrace English too much then they might loose parts of their Japanese culture.

It is possible for students to learn English at university, and more should be done. Almost all High Schools are teaching English, and these schools are becoming more receptive to new teaching methods and new technologies applied to language learning.

Until very recently Japanese law did not permit students to gain credits using the web-based courses, which could be in English or other languages. However teachers can use materials that had been developed in other languages and available from the WWW. Some universities do use foreign courseware but there are difficulties where not all the undergraduates understand English. Courseware and information written in English is becoming more commonly used by graduates and there are people who

advocate that all course at Master level should be in English, especially in the business and scientific fields. There is much talk of a global society and global learning and if people are to talk to each other from all over the world it is most likely to be in English. The Internet is a global phenomenon and much of the available information is in English. The Japanese WWW sites are of not interest to people outside of Japan because they cannot read Kanji. If students realise that more information can be obtained using the WWW then that is a good incentive to learning English

4.4 Courseware from foreign countries

It can be difficult for Japanese students in some subjects to use foreign courseware because the cultural background is different. If the content is about basic or natural phenomena, or it is comments about political activity or social customs in foreign countries it can be used. If the material is of good educational value then it will be used. In some cases it will be translated, possibly by the teacher himself, but this depends on the level of the students.

Many books are imported from other countries, but so far this has done little to improve the linguistic skills of Japanese people. Companies like CISCO and Microsoft have imported software, and the CISCO software although originally written in English has been translated into Japanese.

This question of language and the use of English and/or Japanese is an important issue as Japan would like to be an important player in education in Asia - it would like to see a third area of expertise set up to balance North America and Europe.

Courseware modules have been imported from universities in USA and UK - there are links with Stanford and with Cambridge in UK, and UCL has its own links with Japanese universities.

5. Management of Change due to the Application of Technology to Teaching and Learning

The introduction of change into teaching and learning in Higher Education has been resisted by many academics. One can understand why academics resist change - because the teaching has been carried out in certain ways for many years and some would argue in a very successful manner. However it is difficult to see how the changes required by government can be achieved without the aid of technology. Technology is a facilitator and has to be managed to bring about the change

successfully.

5.1 Accreditation

The Japanese Ministry of Education has now given a dispensation for credits to be achieved through distance education. This had to occur because some universities were giving parts of their courses by satellite or the Internet. So far, this credit was only valid for courses delivered by synchronous communications and course delivered asynchronously, e.g. using the Internet were not allowed a credits. A proposal was put to the University Council and this situation was rectified in 2000. This means 60 credits out of the 124 needed to award a degree can be obtained by synchronous and asynchronous communications methods. Another new area of interest is remote laboratory systems, which can be simulations and virtual reality.

5.2 Implementation

The criteria to permit a course to be moved from an experimental pilot study to implementing it routinely in the curriculum is how well it meets its objectives for instruction or learning, the efficiency of the methodology and its cost effectiveness.

Experimental projects should go through the following stages before implementation. Firstly reaction of the learners should be considered. If this is positive then the content should be considered to test learning effectiveness. If the student cannot receive the information they need then the technology is not satisfactory. The next stage is to examine the application itself, especially to determine how flexible it is. Can this approach, technology, courseware and resources produced to the same principles, be used in the same way in other fields. Finally the effectiveness of the course should be examined.

5.3 Strategy for managing change

The government has been promoting the use of ICT technology in Higher Education and it has made sure that the funds for this purpose do not disturb the main budget. In this way a large amount of money has been made available for technology innovation over the last 2-3 years.

Because the changes involved in introducing educational technology into a university have important effects in the future, decisions about strategy are made by high level committees whose membership usually comprises the President, Deans and expert advisers from the appropriate departments. The success of these committees will depend heavily on the advice they receive. Not all universities have

strategy committees in this field, but grass root opinion is that they are necessary.

An important aspect of the strategy for change is the speed with which it takes place. If things proceed slowly then only the departments with some enthusiasm for innovation will be involved

5.4 Re-appraisal of strategy

As mentioned elsewhere the universities will shortly be moving to an agency status and there is discussion between the government and universities about the frequency of appraisal. A compromise has been reached for it to take place every 6 years.

Universities themselves re-appraise their e-learning and e-teaching strategies between 4 and 8 years, or when a new President is appointed, but there is no general consensus about the frequency.

6. Strategy for Quality Control Management

Quality Standards would ensure a robust technology with the standards designed to maintain stable systems for routine teaching. One accepts that there must be experimentation to obtain reliability and to foster innovative methods but the testing period must cause minimum disruption.

(The relatively small number of responses in this section is indicative of the lower level of importance that is currently given to matters of quality control and standards in this field).

6.1 Quality assurance (QA) management and standards

One can monitor the impact of using technology in education by keeping records of the results of courses being undertaken in the institution year by year, and taking note of the opinions of the people involved, especially of the opinions of the students if you can collect them. It is not easy to get students to express their opinions about teaching and teachers in Japan.

If courseware is introduced from outside the institution, including outside of Japan, it should conform to appropriate Standards, but the problem is what organisation is there in Japan (or elsewhere in the world) to set these Standards. Some professional organisations such as the Institute of Electrical Engineers do have

standards and approval for courses.

6.2 Quality assurance (QA) and evaluation

Assessment is difficult to carry out because we do not have clear standards and criteria to assess the effectiveness of ICT in Higher Education. We have to consider the curriculum, the course content, the teaching method, the use of technology and media systems and the competence of the personnel, as well as considering student achievement. Before we can do this we have to consider the impact of ICT on educational assessment. This is a research area at a number of institutions where there are projects on the effect of ICT on cognitive thinking and subject achievement. These kinds of studies are only just beginning and this research must be encouraged if we are to understand the impact of ICT and improve our strategies accordingly.

Innovation is judged by whether it increases effectiveness and this is measured by improvement in student performance. This can be measured by examination results and by the reputation of the students you turn out, and by whether industry wishes to employ them. The improvement in student performance is the most important outcome, but it is probably the more difficult parameter to measure, as there are differences between teachers themselves. Many people fall back on to the comparison of the performance of students who have been taught by traditional methods and those who have been exposed to the use of technology.

Where teachers are working as teams in subjects like medicine then a valued form of assessment is the reactions of your colleagues and their feedback.

We have to accept that there may be some fields of education which are suitable for using technology and some which are not. Information Technology, science, engineering, languages etc are well suited but some teachers feel a subject like mathematics or philosophy is not.

Some centres do not do assessment of courses themselves relying on reports and publications coming from prestigious institutions like MIT in USA.

Japanese students in traditional universities are not encouraged to interrupt a lecture and ask questions as is common in USA and UK. This means that feedback from students is difficult to obtain; the teachers are not used to seeking their opinions and the student do not expect to be asked.

7. Staffing of Support Centres

In most countries there is no clear career opportunity for those who work in educational technology. It is a new and developing field where the skills required are changing rapidly. There is confusion about the support roles; as to whether they should be classified as academic or technical posts. The skills required to support educational technology range from those that are highly specialised and technical to those that demand a wide knowledge and understanding of the performance and potential of new technologies. Much of the work can only be carried out in multidisciplinary teams. The work usually involves application of the new technologies and consequently R&D effort is necessary before the applications can be implemented for routine teaching within the curriculum.

7.1 Staffing contracts and status

Currently promotion from Associate Professor to Professor is judged by the Judging Committee in each university and an age limit is gradually being introduced. Some universities employ people on contracts, but at the end of a project/contract nobody is laid off.

Often people working in the field of educational technology or educational innovation are employed in the administration division. If these people had the same status as the teaching staff it is possible they would be able to provide support more effectively. If a person is employed as an administrator they are not in a strong position to persuade teaching staff about the approach to innovation and for this reason frequently nothings happens.

In Japan it is not always possible to appoint people to a post because of their achievements and track record if they do not have the required qualifications.

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APPENDIX 1 SHORT CVs OF PERSONS INTERVIEWED

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Promotion activities for educational reform and evaluation. Conducting reform of Undergraduate and Graduate School of Medicine since 1986. Reform of General Education in Hokkaido University since 1991. Member of President's Taskforce of Hokkaido University. Member of Taskforce of Provost of Hokkaido University. Evaluation Committee in Hokkaido University for 10 years

Activities related media usage: -Broadcasting committee in Hokkaido University for 10 years with 200 plus TV programs to introduce academics to public of citizens were produced (Director of this committee for 6 years). Atlas of histology: this includes about 1000 histological images in the homepage, *http://www.med.hokudai.ac.jp/~anat-3w/histology/histat_fre.html.* Movies to explain histology: 20 programs for 15 to 20 min for each in the home page, *http://www.med.hokudai.ac.jp/~anat-3w/movie.html.* Bilateral multimedia education about biomedical research methods, *http://www.med.hokudai.ac.jp/~enshu/theme/index.html*

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APPENDIX 2 METHODOLOGY

1. The approach

The method of obtaining information has been to interview people who have experience in Educational Technology, as developers, users, administrators etc. Each interview was for approximately one hour and the interview recorded.

Literature was sent to the interviewee informing the objective of the survey and giving background information about the survey .

The people interviewed could be divided into six groups: -

1. Staff from University College London
2. Staff from other universities in UK
3. Staff from European universities
4. Heads of Unit in the European Commission
5. Staff from Japanese universities
6. People of independent status

2. Recording

Each interview was recorded using a mini-disk recorder that gave 74 minutes of recording. These devices are small and highly portable. The recorder is battery driven so the recording could take place at any location.

A small lapel microphone was used and the recording monitored. The recorder had an efficient auto-compensating circuit for the record level, so that the system could be set up very quickly without having to carry out time consuming test procedures.

The mini-disks can be write-protected immediately after recording, safeguarding against accidentally erasure of the recording.

Each recording track was limited to 3 minutes that facilitates the transcribing procedure.

The main advantages of the system are it compactness, lightness and ease of set up, producing a good quality digital recording with the minimum of trouble. The main drawback was that the recording tracks could not be shorter than 3 minutes that could make the transcribing procedure frustrating.

3. Preparation of Questions

The objective was to have a common set of question that could be used for all interviews.

The subject was discussed under the following headings: -

1. University environment
2. Relationship between academic and technology Staff
3. e-Technology
4. Innovation in teaching and learning
5. Management of change due to the application of technology to teaching and learning
6. Strategy for quality control management
7. Staffing of support centres

The question bank contains 90-100 questions and in a one-hour interview it was rarely necessary to use more than 20-25 questions.

The survey was designed to get people to talk about their experiences working in the field of educational technology applied to teaching and learning in Higher Education. Most people interviewed had some particular expertise and when the interview came to that topic then the conversation was deliberately free ranging.

The question bank is given in Appendix 3.

4. Transcription of interview to text

It was not easy for the 10 Japanese people who were interviewed in English on a highly technical subject. Naturally there were the difficulties ensuring people understood the questions.

First the spoken word on the mini-disk was transferred to a MSWord text file The Spelling and Grammar Tool was used to correct typing errors and the more obvious grammatical errors. Next the recording was replayed to compare with the text to resolve any passages that were difficult to understand. Then the text was checked for technical accuracy and to highlight those parts where it had not been possible to make an accurate transcription.

In the Japanese recording transcripts were modified to adjust the English text to

read more smoothly. The Japanese people were particularly grateful this could be done because there are significant differences between the order of words and grammar of English and Japanese.

5. Checking transcript

The transcript of the interview was then sent back to the person concerned to check that the correctness of the file and to make any corrections they felt necessary. This also gave the person being interviewed an opportunity to alter or remove any parts they were unhappy about. People were assured that no quotations would be made in the final report that could be attributed to them personally.

6. Processing of Information

Once the interviewee was happy concerning the content of the recording and errors have been corrected, then each interview was analysed. Each interview produced approximately 12-14 text pages and took approximately 15 hours. This produced a file for UK and European interviews of total length approximately 400 pages. The Japanese file was about 160 pages.

These files where then condensed to about 40 pages and were analysed according to the headings listed in paragraph 3 of this Appendix.3.

APPENDIX 3 SAMPLE QUESTIONS

Selection of Questions used in Interviews

This list of approximately 100 questions are representative of the questions used in interviews. The selection of questions was varied according to whether the interview was with an administrator, teacher, technologist etc.

In most cases a selection of questions was sent to the interviewee beforehand. These questions were not followed rigorously during an interview, because if a point of interest was brought up in the discussion that line of thought would be followed through.

This list has been modified as the project progressed, as inconsistencies have become apparent. At the end of the list of questions is a list of technologies that have been considered in the interviews when relevant.

1. UNIVERSITY ENVIRONMENT

General Policy

How extensive is the e- factor concerning teaching and learning in your university?
Does the institution have a serious interest in introducing technology in education?
Does the institution intend to leave the introduction of technology to individual teachers or make it part of its teaching and learning strategy?
Does the institution see the introduction and development of educational technology driven by the teachers - a hands-off and bottom-up approach?
Does the institution see the introduction and development of educational technology driven by the support services - an alternative bottoms -up approach?
Does the institution believe that educational technology should be introduced in limited experiments to gain experience and knowledge of the impact of the technology?
Does the institution believe that the introduction of technology will significantly alter its infrastructure?
Does the institution believe that the introduction of technology will significantly alter the way teaching and learning will develop?

Staff and Resources

Is the institution prepared to deliberately seek to employ staff with educational technology expertise?
Does the institution seek to encourage existing staff to involve themselves in

educational technology expertise?
Is the institution prepared to direct financial resources specifically for technology experimentation?
Is the institution only prepared to invest in technology if it can be applied immediately?
Does the institution believe in encouraging existing staff to seek grants to fund its activity in this area?
Will staff with educational technology expertise be employed on permanent or grant aided contracts?

R and D Activities

Do you believe research and development activity in the new technologies is desirable?

Choice of Technologies

If the institution is only prepared to invest in 'tried technologies' and how will it determine which technologies are suitable?
How would you assess that a technology is 'suitable'?

2. RELATIONSHIP BETWEEN ACADEMIC AND TECHNOLOGIST

The General Relationship

Traditionally the design and delivery of educational courses was solely the responsibility of the teacher. Has the advent of ICT has introduced new methods of teaching and learning, removed the control of the teacher and given this to the pedagogue and technologist?
Do you agree the involvement of ICT in education requires collaboration between the teacher (who defines what is to be taught and how it is. delivered) and the technologist who can advise on the feasibility, cost and reliability of using technology.
Do you agree that there are 3 main skills required producing and delivering courseware (although one person may be able to carry out more than one role)?

Teacher
Technologist
Pedagogue

In UK traditional attitudes encourage amateurism and can result in teachers believing they do not need expert advice. What are your comments?
Educational technology is not restricted to distance learning applications but also has a place in campus education.
Good pilot applications using educational technology arise from a good relationship between the teacher and the technologist.

The Teacher's Role

Do you agree that the role of the teacher is to decide what to teach, what content to use and where to obtain the content?

Do you believe technology can only be introduced if the teacher is prepared to make radical changes to his/her approach to teaching and learning?

Do you agree that the technologist should be involved from a very early stage if it is possible that technology will be used in the teaching and learning scenario?

The Technology Role

Do you agree that if technology is to be used, it is the role of the technologist to advise on how content is obtained and delivered in a suitable format, and how to develop the teaching and learning environment to meet the objectives required by the teacher?

Do you agree that the technologist should advise on both the immediate uses of a technology and its future potential with respect to teaching and learning?

Do you think that the introduction of technology should be an evolutionary process?

Do you agree that if the introduction of educational technology is an evolutionary process it runs a high risk of failure because the process will take place over too long timescale?

Very often the advantages of using technology are oversold by enthusiastic technophiles.

Do you believe that unless the technology can meet the requirements laid down by the teacher/tutor then it has no place in education, or do you believe it is inevitable that there must be compromise?

Teamwork

Do you believe that innovative courseware development requires a multidisciplinary team, including pedagogues, technologists, designers, content specialists etc?

What do you feel about the suggestion that the teacher might not be the leader of the multidisciplinary team

3. e-TECHNOLOGY

What comprises e-Technology?

Would you agree that the 3 principle technologies that influence innovation in teaching and learning are:

Telecommunication

Multimedia display and delivery systems

Courseware authoring systems (including web-based systems)

Do you consider there are any other important technologies?

What do you believe are the technologies relevant to your institution?
Does Technology R&D have a role in your institution?
What do you understand by technology R&D?
What is the main challenge in applying technology to teaching and learning?
Do you expect technology support in-house or are you prepared to buy in?
If you buy in how do you propose to get fast reaction at an economical cost?
Do you consider the overhead to maintain the use of technology is money well spent?

Web-based technology

Currently web-based systems are very popular, but do you believe they are the panacea of innovative teaching and learning systems?
Do you believe there is a strong need for additional functionality in these systems, which is not yet generally available?
Do you know what additional functionality you require?
Do you believe that video/moving images will become more important as teachers and student development more sophisticated requirements?
Do you associate the INTERNET solely with web-based systems or do you see the INTERNET as a delivery system that will support various other types of teaching and learning in the future?
Do you accept there are a number of students who find the WWW difficult to cope with?
If you have distance students using the WWW, how do you propose to give them the same level of technical support as the on-campus students, or do you consider this is not necessary?

4. INNOVATION IN TEACHING AND LEARNING

Innovation and Technology

How much does the technology, to be used in course delivery, influence the way the academic content is selected and managed?
Do you feel that the method of delivery of a course/module should be determined before consideration is given to what the content should be, or vice-versa?
Do you agree that there are occasions when the use of technology has a determining role in the collection of academic content of a course, and can open up new opportunities?
How will the teacher determine which technologies are relevant for his/her purposes?
What do you feel is the best way of starting up innovative projects?

Learner Driven' courseware

What does 'learner driven' mean to you, and do you accept the term; or do you believe the teacher is always ultimately responsible for the learning process?

Do you think nowadays all teaching and learning applications should be 'learner driven' or do you feel that that is just one of a whole range of environments to enhance teaching and learning?

The Support Roles

Do you see the roles of the pedagogue and the technologist as contributing separately to the production of a course/module, or is there considerable overlap?

Would you consult a technologist if applying for external funds to develop an innovative teaching programme?

Would you prefer to find funds so that technology support could be provided internally in your department, or would you use a central service organisation?

Do you see technology automatically linked with innovation?

Web Learning courseware

Are you in favour of the use of web-based learning in your subject area, or do you have reservations about this mode of teaching and learning?

Does the use of web-based learning techniques influence the academic content used in your teaching and also how you deliver the course; if so can you elaborate?

5. MANAGEMENT OF CHANGE DUE TO THE APPLICATION OF TECHNOLOGY TO TEACHING AND LEARNING

Strategy for innovation and change in teaching and learning

Should the institution be interested in systems for benchmarking technology requirements?

How would you develop a strategy for the management of change in teaching and learning and how would you implement that strategy?

Which staff would you involve in developing that strategy and what competences would you expect them to possess?

How do you propose to keep up with changes and developments in technology?

How frequently should the institution re-appraise its strategy in relation to the impact of technology?

Do you feel that educational technology should be introduced in a top-down or bottom-up manner into your institution?

People to develop and implement change

Should the institution include technologists within its committee infrastructure - would it include technologists in its strategy development committee?

Who do you believe should be involved in determining your strategy for change?

Do you believe that some top-down leadership and encouragement is important to give an indication of how the institution would like to see the application of technology in education develop?

How would you ensure you had staff with competences in a wide range of technologies?

Methods of managing change

How would you manage the various stages of the process of implementing innovative teaching methods, from the initial idea of the project, through development, prototyping and finally implementation?

Would you set up a department/unit whose brief is to provide specialist advice or prefer to distribute the technology expertise between various groups in your organisation?

How would you monitor and control the various stages of this strategy?

Does your institution have a model recognising the various stages of a project's development from the conception of the original idea through to implementation in regular teaching in the curriculum?

6. STRATEGY FOR QUALITY CONTROL MANAGEMENT

Quality Assurance procedures for the production and delivery of courseware

How would you use QA processes to monitor and evaluate the impact of technology?

Would you be prepared to introduce courseware designed by another institution so long as it meets standards laid down by a national body?

Would you seek external funding to design and develop teaching and learning projects where you are expected to conform with a Kite Mark?

Would you be prepared to submit projects developed within the institution to external appraisal to gain Kite Mark approval?

Do you expect that QA and evaluation processes for courses where technology has been used will require changes to take into account the impact of the technology?

Will the institution wish to use Learning Management systems or will it use its existing quality control methodology brought into existence for traditional teaching?

Quality Assurance Standards

Do you believe quality control standards should be set by the institution or set by an external agency under national control?

What are the most important outcomes of innovative projects?
What outcomes would the institution require when e-teaching and e-learning is evaluated and how would it establish these?
How would you set criteria to move from the experimental stage to the implementation stage of a project?

Staff to carry out Quality Assurance

What competences would you expect in the staff who would carry out quality assurance procedures?

7. STAFFING OF SUPPORT CENTRES.

Competence of manpower selected to develop new courses and modules

What criteria do you have for the way you select and employ manpower involved in innovation in education?
What status would you accord the staff involved in implementing new technologies?
How do you establish the competences of the staff you select and where do you look for advice?
Do you believe there are differences between the competences required for staff involved with the support services and those involved in research and development?
Could you use the same staff for carrying through projects as for QA measures?
Does the institution accept there is a distinction to be made in the role of technologists and technicians?

Technologies involved in Innovation in Teaching and Learning.

Networks	IP (Internet Protocol) Video-Conferencing - H323 protocols
	IP voice transmission
	Interactive video networks
	Broadband networks
	Radio LAN
World Wide Web	Web-based courseware
	HTML (Hypertext Mark-up Language)
	XTML (Extensible Mark-up Language)
	Knowledge Pools
CAL	Computer Mediated Discussion
	LMS (Learning Management Systems)
	Authoring systems
	Interactivity methods
Telecomms Systems	PSTN (Public Switched Telephone Network)
	Video and Audio Conferencing
	ADSL (Asynchronous Digital Subscriber Line)

	ISDN (Integrated System Digital Network)
	- H320 protocols - Video-Conferencing
Still Images	Digital Photography
	High Resolution images on INTERNET - PowerPoint
Moving Images	Videotape
	Video streaming - MPEG1/MPEG2 formats
	Digital Television
	Interactive Television
Mobile Wireless	WAP (Wireless Application Protocol)
	GSM (Groupe Speciale Mobile)
	GPRS (General Packet Radio Service)
	EDGE 3G (Third Generation mobile)
Satellite systems	GEO (Geostationary systems)
	LEO (Low earth orbit systems)
	MEO (Medium earth orbit systems)

The list is not necessarily complete.